

السؤال الرابع عشر



processing wastewater, then deduce at which phase the organic load starts to be treated, and give the reason for your answer. [4]

- b) Discuss the microbial growth pattern in batch culture of a biological wastewater treatment system. Then, according to your thinking, what might prevent the occurrence of the last phase of this pattern. [8]
- c) Give two examples of the integrated solid waste management, which represents energy technology, and refer to the form of the produced energy in the mentioned examples. [4]

Question [2]: (20 Marks)

- a) Attached growth and suspended growth of bacteria are two different kinds of biological processes that commonly used in waste water treatment. *State* only the name of an example for each process, then *draw* a simple schematic diagram for the chosen

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Final Exam of Wastes Management (Course Code: 412 E) for 4th. Level Environmental Sciences Students

Answer All the Following Questions:

Full Mark: 70 M

Question [1]: (16 Marks)

- a) Draw a schematic diagram for the different phases of *anaerobic degradation of wastewater*, then deduce at which phase the attached growth occurs. [3 M]
- b) Discuss in brief the concept of "the international waste transport", and mention the main recommendations of the Basel's meeting that held regarding to this issue. [4 M]
- c) What is meant by 'the end of pipe measures' under the context of the wastewater management? [3 M]
- d) Compare between *activated sludge* and *side stream membrane bioreactor* processes for wastewater treatment, and use the drawing for clarification. [10 M]

Question [3]: (18 Marks)

- a) Which is the best option for the solid waste management among the following options: - Sanitary landfill, Composting or Incineration? [1 M]

- b) What are the main roles of septic tanks that used for sewage treatment. [3 Marks]
- c) What are the main differences between the current wastewater management system in the old cities, and the newly constructed cities. [5 Marks]
- d) Choose the most appropriate answer for each of the following: [9 Marks]
- 1- (*Biofouling – Crossflow - Enzymatic – Retrofit*) cleaning is the last stage that often used nowadays during the periodic maintenance of the membranes used for the MBR wastewater treatment systems.
 - 2- The dissolved oxygen content of water is (*decreased – depleted – enriched - increased*) by rising the Biochemical Oxygen Demand of that water.
 - 3- Priority pollutants are among the (*radiological – microbiological – physicochemical*) properties of liquid wastes.
 - 4- COD is used to measure the amount of (*biological – chemical – organic – inorganic – oxidant – TOC – colloidal*) content of a liquid waste.
 - 5- In the liquid waste management system, substitution of a chemical fertilizer with organic fertilizer and substitution of phosphorus in detergents with a biodegradable matter are considered as (*self purification – pollution prevention – reuse – abuse*) option.
 - 6- As an example of nutrient recovery from wastewater, ammonia can be recovered and reused – after several conversions and up taking by some organisms – as (*carbohydrates – heavy metals – a protein – an organic fertilizer*).
 - 7- Activated sludge treatment system for the liquid wastes is considered as: (*pollution prevention at source – a recycling of the wastewater within the same process - an end of pipe measures*).
 - 8, 9- One of the drawbacks present in urban wastewater management system is the (*population – dilution – pollution – evolution – option - concentration*), which cases wastage of resources such as (*suspended & dissolved solids – solid wastes – water, N, P & heavy metals - microorganisms*).

Question [4]: (16 Marks)

- a) What is the treatment rate of a wastewater treated biologically in an activated sludge unit working with a hydraulic retention time of 4.7 hours, and has an influent biochemical oxygen demand of 817 µg/ml and a mixed liquor suspended solid of 10140 ppm? [8 Marks]
- b) Calculate the TOC and COD of 27.4 m moles of propanoic acid solution in ppm, knowing that the oxidation of propanoic acid occurs as follows: [8 Marks]
- $$\text{CH}_3\text{CH}_2\text{COOH} + 3\frac{1}{2}\text{O}_2 \longrightarrow 3\text{CO}_2 + 3\text{H}_2\text{O}$$

----- Best Wishes -----

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